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ABSTRACT

This publication acquaints the user with microcomputer statistical packages and offers a method for evaluation based on a set of criteria that can be adapted to the needs of the user. Several popular packages, typical of those available, are reviewed in detail: (1) Abstat, an easy to use command driven package compatible with the IBM PC or the Apple II, can translate raw scores to z-scores; (2) Apple Interactive Data Analysis (AIDA) allows users to alter or program their own routines, using BASIC; (3) CRunch Interactive Statistical Package (CRISP), a menu-driven package for the IBM PC, has clear documentation; (4) Microstat, a menu-driven package for the IBM PC, is very easy to use; (5) Statistical Processing System (SPS), a menu-driven program, tends to have statistics favoring the natural sciences; and (6) Statistical Package for the Social/Sciences/Personal Computer Version (SPSS/PC) has retained the most important routines of the original SPSS. Examples of the basic command structure of statistics packages are offered in Appendix A. Appendix B, a compendium of microcomputer statistical resources, lists but does not evaluate important features of approximately one hundred programs. (GDC)

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MICROCOMPUTER PROGRAMS FOR EDUCATIONAL STATISTICS:

A Review of Popular Programs

TME Report 89

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1985

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Early in the evolution of microcomputers, statistical packages were often used in educational research for instructional demonstrations or simulations. Many of these innovative statistical packages became widely distributed (**Weed's Introductory Statistical Package** distributed by CONDUIT). However, the amount of memory, the ease of data entry, and the display of results were generally limited in early microcomputer programs. Programs had to be limited because of the lack of capabilities of the microcomputer. (Some of the programs reviewed in this paper did not exploit the advantages that the newer microcomputers offer, such as high resolution graphic output and automated data entry, features uniquely suited to the microcomputer.)

Despite many drawbacks, students, professors and researchers are using microcomputers, even though most have access to mainframe or minicomputers that have excellent statistical programs. Some of the reasons for increased use of microcomputers are: availability of the machines, lower operating costs, flexibility in use, and innovative features not found on mainframe statistical programs.

Over the last ten years, manufacturers have increased the processing speed, power, and sophistication of the microcomputer. The memory capacity and processing speed of some microcomputers today has made their use appropriate for many data sets, not only for classroom demonstration, but also for actual research purposes. Ease of use, availability, and ability to customize are all strong features that make the

microcomputer a new and viable choice of many educational researchers and instructors. The microcomputer may become a universal tool for the researcher by the inclusion of multipurpose software such as word processing, data base management, and spreadsheets. With increased power and sophistication of the microcomputer, well over a hundred statistical packages are now available. (In the Compendium in Appendix B we noted 56 packages for the Apple II, 37 for the PC and MSDOS, 17 for CP/M, 7 for the Apple Macintosh, 5 for Tandy, 4 for Commodore, and 2 for Atari). Most of the statistical packages are for the Apple II family of computers, but recently programs for other brands of computers have become popular as more memory and processing capability have developed. Further, as microcomputers become more flexible and contain additional memory capacity and processing speed, many programs available on larger computers are now becoming available on microcomputers. For example, SPSS (Statistical Packages for the Social Sciences, one of the larger and more popular mainframe/mini-computer packages) is now available on the IBM PC and compatible systems and has adequate power for most educational research data sets.

The purpose of this paper is to acquaint the user with the use of microcomputer statistical packages and to show how to evaluate them. Since users have varying needs, we have provided a method by which packages may be evaluated using individual criteria. For purposes of illustration, we will include an evaluation of several popular packages using our own criteria.

For evaluation purposes, we have chosen programs that work on Apple II or IBM PC's or compatibles. Several packages have versions that work on both.

VARYING PROFILES OF EDUCATIONAL STATISTICS USERS

It would seem an easy task to review statistical software for microcomputer use: just sum up the features and the most must be the best. Such, however is not the case. It is difficult to evaluate statistics packages for three reasons:

1) Statistical software requires special evaluation because of the adequacy of the statistical routines and the utility of the routines to different users.
2) Any software requires evaluation of how the human interfaces with the computer. Many statistical packages could be greatly improved if they offered easier data entry and command structure.
3) The user of software may have one or more unique purposes in mind for the software package (i.e., teaching statistics or doing data analysis).

We have divided users into two classes: 1) data analysts and 2) statistical teachers and students. Data analysts can be further delineated into occasional users and frequent users. Occasional users are educational professionals who rarely need to compute statistics, either because they compute preliminary and exploratory analyses or because they leave more complicated statistics to a consultant. In addition, there are frequent users who enjoy doing much of or all the data analysis themselves.

DESCRIPTIONS OF POPULAR STATISTICAL PACKAGES

We reviewed several packages typical of the many that are available. The packages we reviewed, though not all-inclusive, will provide an understanding of the features to look for in evaluating any package. A brief description of each package reviewed follows.

ABSTAT(4.07). Abstat is a general-purpose package that is command driven. It has a very basic and fundamental number of statistical procedures. It is available in CP/M-80, 86, and MSDOS versions so that it can be run on an IBM PC or an Apple II or IIe with a Z-80 card. For the amount of statistics this package has, it comes in a surprisingly small package and takes up very little disk space. The documentation is sparse, but adequate. The package is easy to use, and it does a reasonable job of handling errors. It is one of the few packages that translates raw scores to z-scores--a capability that comes in handy for some educational researchers/instructors. Output can be routed to the printer, to disk, or to the screen, thus providing flexibility. Graphic output, however, is of low quality. The latest release of this program has improved the package greatly.

AIDA. Apple Interactive Data Analysis. AIDA is a general-purpose, command driven package intended for the Apple II line. A one-card reference sheet provides the user with all of the commands required. Until users are familiar with the command structure, they must rely on the reference card or use

the on-screen help available. By means of a clever virtual memory scheme, AIDA is capable of using relatively large data sets. AIDA also allows users to alter or even program their own routines (the entire package is in BASIC). The largest range of numbers is plus or minus 32,767, a reasonable range for most educational research. The way subjects are grouped (or declared in commands) is slightly different from many other packages. But once the user gets used to it, it offers more flexibility than many packages. The user must know the size of the database before running an analysis in order for it to run properly. This task can be accomplished by a catalog command (prior to running AIDA)--a minor inconvenience.

CRISP. CRunch Interactive Statistical Package. CRISP is a general-purpose, menu-driven package for the IBM PC. Even though it is menu-driven, it allows the user to access rapidly the desired analysis. In fact, its menu(s) can be helpful to remind the user of what options are left. For example, it will serve as a reminder that post-hoc comparison after an ANOVA can be run. We were told by the developers that an automatic (batch mode) form of commands is being designed. CRISP has a limit of 252 variables, but the number of cases is limited only to the amount of disk space. As with AbStat, output can be routed to the screen, a printer, or to disk, giving the user a great deal of flexibility. Data destructive commands have safety factors built in to avoid costly errors. Documentation is crisply written (no pun intended), very clear, and easy to follow. Unlike AIDA, however, CRISP does not allow the user to get at

the source code directly to add to or modify the program, but the documentation includes a description of how users can write and compile their own codes so that they can make additions and changes. Data may be input from dBase II and Lotus DIF files.

Microstat (Version 9). Microstat has one of the easiest to use general-purpose, menu-driven packages for the IBM PC that we reviewed. We ran this package with confidence without feeling a need to use the manual. For instructors, it has a "nice feel" that probably would not intimidate students or new users. The manual, though sparse, is well organized. Unlike previous reviewers (Carpenter, et. al., 1984), we encountered no error handling problems. As with AbStat, however, graphics are of relatively poor quality.

SPS. Statistical Processing System. SPS is a general-purpose, menu-driven program with both Apple and IBM PC versions. This review was based on the IBM PC version. SPS has an adequate amount of statistics and tends to have statistics that favor the natural sciences. It has a relatively strong regression and general linear model series. Its documentation is adequate but not nearly as well laid out or comprehensive as CRISP or SPSS/PC. As with AIDA, the basic code is accessible for modification by the user. Its graphic output does not take advantage of the high resolution graphics.

Its developers were sensitive to the need to transmit data to other machines, so both the program and the documentation allow the user the manipulation of ASCII files.

SPSS/PC. Statistical Package for the Social Sciences/Personal Computer Version. SPSS on mainframes and minicomputers has been one of the most popular statistical programs, with over 6,000 installations and 40 operating systems (data from 1970 to 1975). The PC Version is available on the IBM PC and compatibles. Although the PC version does not have the full complement of statistical procedures found in the original mainframe versions, it has retained the most important routines. Its documentation, the inclusion of a tutorial disk, could set the standard for other packages to follow. Its command structure is command-driven and generally requires that users have the manual in-hand while using it. Only the most experienced users do not need the manual. However, it follows the command structure of the mainframe original closely, so if SPSS/PC is learned first, few problems may be encountered in the use of SPSS on a mainframe or in moving from the mainframe version to a microcomputer using SPSS/PC. Thus, SPSS/PC may be a real benefit to users who might be coming from or going to locations that have SPSS installed on their larger computer network. SPSS, Inc., has included Kermit (a public domain data communications package) which allows error-free transfer of files to and from larger computers and other microcomputers for analysis. SPSS/PC is not without faults. CRISP is by far an easier package to learn and to remember how to operate. SPSS/PC must be installed on a hard disk system (such as the XT) and requires over three megabytes of storage for the source code. The user must always install the "key diskette," even though all of the program is stored on hard disk (for copyright

protection). This protection scheme is annoying and detracts from one of many reasons people use hard disks: namely, speed and ease of use. However, a spokesperson for SPSS told us that the protection scheme will be changed for release 2.0. One other problem is that SPSS/PC is noticeably slower than CRISP, but this appears to be a trade-off between a number of extended functions found in SPSS/PC and speed of operation.

SELECTING THE RIGHT PACKAGE

The answer to "What is the right package?" is that there is no single right package. There are many very good and excellent packages. But there is no one computer package that offers a totally comprehensive set of statistics and that is right for every user. Ideally, if an instructor for a data analysis course were choosing a package, he or she would choose a package that was easy to use and easy for students to use and/or purchase, or to find at other locations.

It is more likely that the frequent data analyst may need to use several mainframe or microcomputer packages for various analyses. Thus, frequent users, who use a variety of statistical procedures, need to put a premium on packages that allow the data to be stored in a manner permitting easy transfer of data between computers. The most standard form is called ASCII (American Standard Code for Information Interchange) Text. Many telecommunication programs can be used to transfer the data from computer to computer.

EVALUATING STATISTICS PACKAGES

Evaluating statistical software packages can be difficult, depending on the needs of the user. Many variables can be used to evaluate packages, and most need to be taken into consideration to fully evaluate many distinctly different programs. Users are referred to the following evaluation articles: Lachenbruch, P.A., 1983; SIGSTAT, 1983; Berger, et. al., 1984; and Goodban and Hakuta, 1984. A further problem for evaluation was the traditional differences between use for teaching and use for research. Thus, we used the features listed in Table 1 (which were an adaptation of Goodban and Hakuta, 1984) to evaluate statistical packages in two different ways. First we rated each feature of each program on an absolute scale, or criteria on a scale of 1=poor, 2=fair, 3=good, 4=very good, 5=excellent. Then we weighted each criteria based on its statistical value, and again on its educational value. Thus, each program reviewed has a composite (total) score which is made up of two separate (total) scores, one for "traditional" research purposes and one for use in education or training. These guidelines were produced on a Multiplan spreadsheet so that we could easily enter and edit the evaluation, and we could expand or change the form easily in the future. Readers are invited to produce their own weights and to evaluate other packages.

We divided our evaluation into four categories: documentation, data handling, user interface, and statistical procedures.

Documentation. Documentation is important for new users, or occasional users. Notice that in Table 1 we weighted the research criterion twice that of the educational, since we expect the instructors to be familiar with the package. Researchers may not have access to experienced users, and consequently will be "on their own" more often than students.

Manuals vary in the quality of organization and presentation. It is important for good documentation to be well written so that important points can be easily found. Good documentation usually includes a large quantity of sample output and input commands. The index should be comprehensive, even to the point of listing relatively minor topics. Documentation may also include references that are available "on-line," that is, summoned and displayed on the computer while the user is running the program.

Data Handling. As we described earlier, no package is comprehensive enough to use for all needs; therefore, there is a need to consider the ability to manipulate data (Abstat, CRISP, and Microstat interface with DBASEII, a very popular database management system giving them even greater flexibility and usefulness). The input method varies from one package to another. SPSS/PC uses a more conventional rectangular data structure, meaning that the data are placed in rows and columns where the specific row or column contains the case (subject) or variable value. CRISP and AIDA, for example, have special data entry programs that prompt the user for each value. The ability to edit existing data is important, since it is almost always

the case that errors or "wildcodes" will be found and need correcting. Often, a researcher may reach a point where the data set size is too large (e.g., a large N) or where a specific statistic is not available on a microcomputer package. In this instance, it is useful to be able to transfer the data electronically to a larger computer (i.e., mainframe) without having to re-key (re-enter) the data.

User Interface. It is important for a good statistical package to be easy to use and have at least adequate enough speed to be useful (and not time consuming). The ease-of-use is sometimes traded off by the ease-of-learning. Appendix A describes the differences and benefits of using different command structures. The criteria we used were independent of the type of command structure and were based on how easy it was to use with and without the manual, for example: how hard is it to learn the command structure? How easy is it to use the commands, once learned? Also, probably one of the most important lessons we have learned is the amount of user support available from the manufacturer. CRISP and SPSS are two outstanding examples (so are many others that we have reviewed here) of user support. We have called both of these companies and have received more than adequate help in solving technical problems we have encountered. All of the companies we reviewed were committed to providing a good product. They have continued to update their products by listening to their users and making improvements.

Statistical Procedures. We tried to include the most popular and frequently used statistical procedures. Each package had more procedures that may not have been included on our list. Therefore, users might wish to add their own procedure categories for evaluation, and when looking for a package, make sure that they have in mind what sort of procedures will be needed. If they have a procedure that is used highly infrequently, and if they have access to other machines with that procedure, they should place a premium on the transfer ability. In addition, we could have added other categories such as AIDA's use of case weighting, which might be important to a user considering different sampling fractions.

The statistical packages we have chosen to evaluate represent a broad spectrum of some of the most popular packages. AIDA, SPS, ABSTAT (CP/M), have versions for the Apple II family. CRISP, SPSS/PC, ABSTAT(PC DOS), and SPS have IBM PC versions. Those packages that offer both Apple and IBM versions give the statistics instructor and/or the researcher extra flexibility because students or users can use either version and not have to learn a new package command structure.

TABLE I

EVALUATION OF STATISTICAL PACKAGES

DOCUMENTATION	ABSTAT	AIDA	CRISP	MICRO STAT	SPS	SPSS/PC
1. Overall quality readability, and organization (1,2)*	4**	2	4	4	4	5
2. Descriptions of computational formulas and methods (2,2)	4	-	4	4	4	5
3. Index (.5,2)	4	4	3	-	3	5
4. Listing of error messages (2,1)	2	2	4	2	3	3
5. On-Line help or reference card (2,1)	3	3	3	-	3	3
DATA HANDLING	**ABSTAT**	**AIDA**	**CRISP**	**MICRO STAT**	**SPS**	**SPSS/PC**
6. Input Data (2,1)	3	3	3	3	4	3
7. Editing to change existing values (1,2)	2	4	3	3	4	4
8. Missing Values (2,2)	3	4	3	3	3	4
9. File Manipulation (1,1.5)	3	3	4	3	4	4
10. Input to ASCII file (0,2)	3	3	3	3	3	4
11. Output to ASCII file (0,1)	3	4	3	3	3	3
12. Formatted Output to ASCII file (0,1)	2	4	3	3	2	3
13. Recording, Transforming Data (1,2)	3	3	3	3	3	3
14. Ability to accept character as well number (2,1)	-	-	-	-	-	-
15. Ability to sort and merge files (0,1)	3	1	3	3	3	3
USER INTERFACE	**ABSTAT**	**AIDA**	**CRISP**	**MICRO STAT**	**SPS**	**SPSS/PC**
16. Command Structure (3,1)	3	3	4	4	3	3
17. Data Size (1,3)	4	4	4	4	4	4
18. Accuracy (1,2)	4	2	4	3	2	4
19. Speed (.5,2)	4	1	3	3	2	2
20. User support (.5,1)	3	3	4	4	3	3

* Educational weighting with the first number and research with the second number.

** 1=poor, 2=fair, 3=good, 4=very good, 5=outstanding.

TABLE I, (continued)

EVALUATION OF STATISTICAL PACKAGES

STATISTICAL PROCEDURES	ABSTAT	AIDA	CRISP	MICRO STAT	SPS	SPSS/PC
21. Means (1,1)	3	3	4	3	3	3
22. Median (1,1)	3	3	4	3	3	3
23. Standard Deviation (1,1)	3	3	4	3	3	3
24. Frequencies (1,1)	4	3	4	4	4	5
25. Scatter Plots (1,1)	3	2	4	3	3	4
26. Cross-Tabulation (1,1)	3	3	4	3	3	3
27. One-Way ANOVA (1,1)	3	4	4	4	4	5
28. Two-Way ANOVA (1,1)	3	-	3	3	3	3
29. Repeated Measure ANOVA (1,1)	3	-	4	-	-	-
30. Multifactor ANOVA (.5, 1)	-	-	3	-	-	-
31. ANCOVA (1,1)	-	-	-	-	-	5
32. Student t-test (1,1)	3	4	5	3	4	5
33. Correlated student t-test (1,1)	3	3	3	3	3	5
34. Spearman's coefficient of correlation (1,1)	3	4	4	-	3	5
35. Pearson's coefficient of correlation (1,1)	3	3	4	3	3	5
36. Simple Linear Regression (1,1)	3	3	3	4	3	3
37. Multiple Linear Regression (1,1)	3	3	4	3	4	4
38. Polynomial Regression (1,1.5)	3	4	4	3	3	4
39. Residuals (1,1)	-	3	3	4	-	5
40. PCA/FA (1,1)	-	-	4	-	3	5
41. Canonical Correlation and discriminant function (.5,1)	-	-	-	-	-	4
42. Multi-dimensional scaling (.5,1)	-	-	-	-	-	-
43. Kruskal-Wallis (1,1)	3	3	4	3	-	4
44. Mann-Whitney U (1,1)	3	-	4	-	-	4
45. Wilcoxin (1,1)	-	-	4	3	-	4
46. Missing Value Handling (1,1)	3	3	3	3	2	5
47. Additional Graphic Capabilities (2,2)	-	4	3	-	2	3
48. Readability of standard table format (1,1)	3	3	3	4	2	5
49. Flexibility of table layout, titles, labels (.5,2)	3	2	3	3	2	5
50. Display of significance tests and stated probability (3,2)	4	4	4	1	1	5

TABLE II

COMPOSITE SCORES OF STATISTICAL PACKAGES

SOFTWARE	OPERATING SYSTEM/ MACHINES	PRICE*	AVERAGE SCORE	COMPOSITE SCORE**	EDUCATIONAL SCORE**	RESEARCH SCORE**
ABSTAT	C,P	$395 (.82)	3.2	325.0(3)	142.5(3)	182.5(3)
AIDA	A	235 (1.22)	3.1	288.5(5)	129.5(5)	159.0(4)
CRISP	P	495 (1.35)	3.6	381.0(2)	176.5(2)	200.5(2)
MICROSTAT	C,P,D	375 (.75)	3.2	283.0(6)	123.0(6)	160.0(4)
SPS	P,A	395 (.74)	3.0	292.0(4)	132.0(4)	160.0(4)
SPSS/PC	P	800 (.53)	4.0	425.5(1)	194.0(1)	231.5(1)

A= Dos 3.3 is Apple Disk Operating System
C= CP/M-80
D= CP/M-86
P= PC Dos is IBM PC Disk Operating System
* The numbers in parentheses after the price represent cost/performance ratio.
** The numbers in parentheses after the scores represent rankings, 1=highest

Table II represents the essential information about the packages we reviewed. If one were intending to buy a package that would serve both research and teaching interests, one could look at the composite scores. SPSS/PC clearly ranks first in all categories. However, SPSS/PC is not all that easy to use (although it is easier than SPSS, for the mainframe). Notice that the first two highest ranking programs (SPSS/PC and CRISP) are for the IBM PC. The next highest, AbStat has a considerably lower score than the first, but it also offers Apple and IBM versions. The next three (AIDA, SPS, and Microstat) are similar in quality.

SPSS/PC ranks first and CRISP ranks second for research use; the rest of the packages appear to have about equal power.

The educational composite rankings follow rankings similar to the composite scores. Except for SPSS/PC and CRISP, the other packages appear to be similar in quality, with AbStat perhaps having a slight lead. However, when considering cost/performance, and the equipment required for purchase, it would appear that AIDA could represent a real bargain, depending on the user's needs.

PACKAGES WE DID NOT EVALUATE

There are many more packages worthy of evaluation (see Appendix B). Actually we were quite pleased by all of the packages in the evaluation. Two relatively recent packages for microcomputers are ABC (by the Institute for Social Research, The University of Michigan, Ann Arbor, Michigan 48109) and BMDPC (by BMDP Statistical Software, 1964 Westwood Blvd., #202, Los Angeles, California 90025). ABC is a very distant cousin to the mainframe package OSIRIS.IV (although the command structure is entirely different; see below). BMDPC has a direct connection to the BMDP series on mainframes. The only other popular major mainframe statistics package that does not presently have a PC namesake is SAS(Statistical Analysis System by SAS Institute, Inc., Cary, North Carolina). Such a popular package would be appropriate for microcomputer, and one wonders if SAS might be working on some sort of microcomputer package.

ABC offers a new and unique user interface. Its design philosophy is based on features of the personal computer. It uses a direct command prompt mode, but offers the user an

elaborate amount of help. It was designed to be used as an instructional tool, or for the occasional user who does not want to have to remember a long series of commands. The additional help mode can be turned off, so that frequent users need not read through routine statements. Its documentation is quite good. However, it is not as comprehensive as the packages evaluated here. It has a good descriptive, crosstabs, and a regression series, and may be useful to specialized courses or as an adjunct to other packages.

Ed Stat Pac (listed in Appendix B) has a curious history. Ed Stat Pac was written in BASIC by Carl F. Berger early in the history of microcomputers. He and his colleagues have added to it frequently, so that it now has a broad spectrum of parametric and nonparametric statistics. It was intended to fill the gap where just a quick statistic was needed here or there. It was not intended to compete commercially; consequently, it did not concentrate on an elaborate human/computer interface. It just runs; that is, if you are semi-computer-literate. Because the programming was so straight- forward, we were able to program it on a variety of machines (see Appendix B). It has also become quite useful for teaching students about BASIC programming (using Statistics as the vehicle) and about data structures and handling.

RECOMMENDATIONS

We began by saying that inevitably a user may have to purchase or use more than one package. Of course, even our lowest evaluated package, MicroStat, has a very useable number of statistics and, we believe, should be helpful to most educational researchers. The way the user interfaces with the package is also a matter of taste (although it is more important for instruction and training to have a generally easy-to-learn interface). Of course, price has a way of dictating taste. Even though SPSS/PC looks inexpensive, it requires special purchases such as an XT, and further, takes up a large amount of disk space that XT users often wish to use for other purposes. Most of these packages offer a variety of discounts to educational institutions that can also affect pricing and purchase decisions. So the best way for users to go about deciding on which package is best is to evaluate their own needs. Then they could weigh the most important items more heavily and customize their decision. The packages we chose to evaluate were all very popular and we would be happy to use any of them, but like other users, we have our own unique needs and our own favorites.

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APPENDIX A

BASIC COMMAND STRUCTURE OF STATISTICS PACKAGES

Just as there are differences in the users of statistical packages, there are different ways of giving commands to the computer to generate statistics. There are basically two pure types of command structures for statistics packages: 1) menu driven and 2) direct commands.

Menu driven programs produce a menu on the screen and allow the user to "pick" a statistic from the menu much like you might pick the "#1 special" in a restaurant. Only #1 in this instance might mean the Chi Square Analysis. The following example is from the CRISP statistical package manual* (the bold type represents what the user types into the computer):

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*Option                                                    Current Status *
*  1  Number of between subjects factors                    1              *
*  2  Number of within subjects factors                     1              *
*  3  Tests of assumptions for within subjects effects      No             *
*  4  Type of solution when n's are unequal                 Hierarchical   *
*  5  Output to screen, printer or diskette                 Screen         *
*  6  Means and standard deviations through combin-                        *
*     ations of how many factors                            2              *
*  7  Correlations matrices output for each cell and                       *
*     pooled over all cells, pooled only or none at all     None           *
*  8  CSC' matrices output for each cell and pooled                        *
*     over all cells, pooled only or none at all            None           *
*  9  Compute intraclass reliability coefficient            Not relevant   *
*  A  Save ANOVA defaults                                                  *
*  B  Return to control program                                            *
*                                                                          *
*     Press enter when satisfied with options or enter                     *
*     number of option to be changed:  7                                   *
*                                                                          *
*  Note that this option implies tests of within subjects effects.         *
*                                                                          *
*  A Correlation matrix of the variables making up the within subjects     *
*  factors can be out put for each cell and pooled over all cells          *
*  (E), pooled only (P), or not at all (N).  Enter E, P or N: E            *
*                                                                          *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

*excerpt from the CRISP Documentation Manual, 1984, with authors' permission.

Once the user has completed typing in the responses to the menu, the statistical analysis is carried out by the computer with the following sample results:

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                             *
* ANALYSIS OF VARIANCE          Dependent variables:   B1 B2 B3               *
* Source     df      SS(H)        MSS         F          P     P(E-ADJ)  P(CON)*
* Between                                                                     *
* Subjects   11   635.5559                                                    *
* A(A)        2    22.9333    11.4667     0.168    0.8487                     *
* Subj w                                                                      *
* Groups      9   612.6223    68.0691                                         *
* Within                                                                      *
* Subjects   24   599.9996                                                    *
* B           2   365.0556   182.5278     84.076   0.0000   0.0000    0.0000*
* AB          4   195.8667    48.9667     22.555   0.0000   0.0000    0.0003*
* BX                                                                          *
* Sw6ps      18    39.0778     2.1710                                         *
* Do you want to carry out post-hoc comparisions? Y                           *
*                                                                             *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

Notice that menu instructions can be a part of the analysis print-out.

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                             *
* Post-hoc Analysis Options    Current factor:  A(A)                          *
*                                                                             *
*  Option    Result                                                           *
*   1        Display post-hoc test results for current factor                 *
*   2        Set output device (Currently:  Screen)                           *
*   3        Display post-hoc tests for all factors                           *
*   4        Reset current factor                                             *
*   5        Continue with next factor                                        *
*   6        Specify post-hoc tests to be computed                            *
*   7        Display the analysis of variance table                           *
*   8        Set maximum P-value to be displayed (Currently 0.1000)           *
*   9        Continue with ANOVA program                                      *
*   A        Return to control program                                        *
*                                                                             *
*            Enter options choice:  6                                         *
*                                                                             *
*                                                                             *
*                                                                             *
*   Choice of post-hoc tests                                                  *
*                                                                             *
*  Options     Test                                          Calculated?      *
*   1        Scheffe                                       Yes               *
*   2        Turkey-A                                      No                *
*   3        Turkey-B                                      No                *
*   4        Newman-Keuls                                  No                *
*   5        Bonferroni                                    No                *
*   6        t-tests                                       No                *
*   7        Dunnetts                                      No                *
*   8        Sidak                                         No                *
*   9        REGWF                                         No                *
*                                                                             *
*   Enter option number or press enter:  4                                    *
*                                                                             *
*   Choice of post-hoc tests                                                  *
*   Option     Test                                        Calculated?        *
*                                                                             *
*   1        Scheffe'                                      Yes               *
*   2        Tukey-A                                       No                *
*   3        Tukey-B                                       No                *
*   4        Newman-Keuls                                  Yes               *
*   5        Bonferroni                                    Yes               *
*   6        t-tests                                       Yes               *
*   7        Dunnetts                                      Yes               *
*   8        Sidak                                         Yes               *
*   9        REGWF                                         Yes               *
*                                                                             *
*   Enter option number or press enter:  2                                    *
*   Maximum of 7 post-hoc tests reached.                                      *
*                                                                             *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

```
Post-hoc tests for factor B
Level        Mean
  1          6.417
  2         12.667
  3         13.583

                        Newman    Bon-
Comparison  Scheffe   -Keuls*  ferroni T-test  Dunnett  Sidak   REGWF
  1 < 2     0.0000    0.0100   0.0000  0.0000  0.0100   0.0000  0.0000
  1 < 3     0.0000    0.0100   0.0000  0.0000  0.0100   0.0000  0.0000
  2 < 3     0.3331             0.4348  0.1449  N.A.     0.3748  0.2093

* The only possible P-values are .01, .05 or .10 (up to 1.0000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

Press enter to return to post-hoc menu:
```

Menus are most helpful to occasional users or to students. The user can select the statistics with little need for a manual of documentation. With ease of use and simplicity such fine features, why shouldn't most packages use menus? The reason is that after using menus for a while and being more familiar with a program, a more frequent user would still have to go through all the menus to get even the most simple results. Frequent users sometimes find menus cumbersome and slower to use than direct commands.

Direct commands are more difficult to learn, but allow the user faster access to the statistics. There are two types of direct command structures; 1) prompt and 2) complete command. Prompt commands mean that the user has a limited vocabulary of words to type in following a prompt. For example, AIDA (Apple Interactive Analysis)* while using its Xpert user command mode structure (for experienced users) uses a prompt structure like:

*permission granted from Dr. David Lingwood, Apple Interactive Data analysis

```
*COMMAND ? MULT
*
*  Y=1;2^4
*  OPT=MATRIX
*
*LOWER
*CORR. MATRIX
*
*  2      .67350007
*  3      .531972417      .144722411
*  4      .347498149      .352075488      .0225188676
*VARIANCES
* 8.68421053           7.10263159      4.47368422
* 4.88421053
*MEANS
* 5.5    4.95            5.5             5.4
*VARIABLES
* 1Y ATTITUDE 2X1 AUTHORT 3X2 DOGMAT
*4X3 RELIGOS
*
*INVERSE I.V.MATRIX
*
*2 1.1664246
*3 -.159640922           1.02235637
*4 -.407074577           .0331833479     1.14257373
*
*REGRESSION ON Y1Y ATTITUDE
*
*   I.V.           BETA           B           PART          F
*
*2X1 AUTHORT        .559         .618          .268        12.756
*3X2 DOGMAT         .448         .624          .196         9.335
*4X3 RELIGOS        .141         .187          .017          .822
*CONSTANT                      -2.005
*
*MULT.R=            .815    R SQ=             .664
*S.E. EST=         1.862       F=           10.526
*N=                20          DF=          3/16          P= .0007
*
*SAVE RESIDUALS Y/N Y
*V#, LABEL 5,RESIDUAL
*N. DEC3
```

The complete command structure is the most difficult to master but once learned can be very time saving. In this structure, the user must supply all of the commands at one time. SPSS/PC (Statistical Package for the Social Science for the Personal Computer), is a package that allows the user to enter the entire command structure at one time (actually it works interactively or by using the include command). An example taken from the SPSS/PC* manual of such a command and the resulting output follows:

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*DATA LIST FILE='AXTABS.DAT'                                                      *
*/DRUNK 1 AGE 2-3                                                                 *
*RECODE AGE (LOW THRU 29=1) (29 THRU 40=2) (40 THRU 58=3)                         *
*                          (58 THRU HI=4) /DRUNK (1=1) (2=2) (ELSE=8)             *
*MISSING VALUE DRUNK(8).                                                          *
*VARIABLE LEVELS AGE 'Age in Four Categories'/                                    *
*               DRUNK 'Ever Drink Too Much'.                                      *
*VALUE LABLES AGE 1 'Youngest Quarter' 4 'Oldest Quarter'/                        *
*               DRUNK 1 'Yes' 2 'No' 8 "Don't Drink/NA".                          *
*CROSSTABS TABLES=DRUNK BY AGE                                                    *
*         /OPTIONS=3, 4                                                           *
*         /STATISTICS=1,4,6,7,8,9.                                                *
*FINISH.                                                                          *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

*PP. D-9,D-10, SPSS/PC: For the IBM PC XT, 1984. Permission from SPSS Inc. granted for the use of this illustration.

Crosstabulation: DRUNK Ever Drink Too Much By AGE Age in Four Categories

AGE-/ DRUNK	Count / Row Pct / Col Pct	Youngest Quarter 1	2	3	Oldest Quarter 4	Row Total
Yes	1	62	33	36	16	147
		42.2	22.4	24.5	10.9	38.5
		57.9	34.7	37.9	18.8	
No	2	45	62	59	69	235
		19.1	26.4	25.1	29.4	61.5
		42.1	65.3	62.1	81.2	
Column Total		107	95	95	85	382
		28.0	24.9	24.9	22.3	100.0

Chi-Square	D.F.	Significance	Min E.F.	Cells With E.F./5
31.57228	3	0.0000	32.709	None

Statistic	Symmetric	With DRUNK Dependent	With AGE Dependent
Lambda	0.09716	0.11565	0.08727
Uncertainty Coefficient	0.04150	0.06382	0.03075
Somers' D	0.23546	0.19222	0.30381

Statistic	Value	Significance
Kendall's Tau C	0.28768	0.0000
Gamma	0.39632	

Number of Missing Observations= 118

Thus the kind of command structure must be considered along with the kind of microcomputer, the number of statistical routines, and the form of the output, as well as the ease of data entry.

APPENDIX B

COMPENDIUM OF MICROCOMPUTER STATISTICAL RESOURCES

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Paul M. Stemmer, Ph.D.
Carl F. Berger, Ed.D.

The listings below are intended to serve as a source of inquiry for the researcher. They are not neccessarily comprehensive, nor are they guaranteed to be accurate. In some cases, the descriptions do not do the packages justice. In other cases, they may be far too generous. This is a listing, not an evaluation. The list should not be considered an endorsement of a particular product. This is not an advertisement. Some of these references were obtained from the commentary of Hugh Neffendorf, in The American Statistician, Feb., 1983, Vol. 37, No. 1, pp. 83-86. NK="Not Known" =British Pound.

STATISTICAL RESOURCES

Package Name	Vendor	Description	Language	System	Approx. Price*
ABC	Consortium Software, Inst. for Social Research, The Univ. of Michigan, Ann Arbor, MI 48109 313/763-3482	Data manipulation, descriptive, uni , regress., Xtables	Fortran	MSDOS 256K 512K	$600
ABSTAT	Anderson-Bell P.O. Box 191 Canon City, CO 81212 303/275-1661	Data manipulation, editing, regression, ANOVA, cross-tab., chi-sq., histograms, plots, descriptive, tests, others	Pascal	CP/M	$395
ADVANCED MATHEMATICS	Great Northern Computer Services 116 Low Lane Horsforth, Leeds LS18 5PX United Kingdom	LP, regression, interpolation, control theory, roots of function, num. integration, matrix manip., diff. equations plotting	Basic	Apple	£50

*Represents List Price. Discounts (sometimes substantial) may apply.

Package Name	Vendor	Description	Language	System	Approx. Price*
AIDA	Action-Research, Northwest (A-RN)11442, Marine View Dr. SW. Seattle, WA 98146	Histograms, ANOVA, descriptive, bivariate, multivariate, tests, corr., regress., plots, transformation, weighting	Basic	Apple II	$235
AIDA	Appli-Tech Software Services, Broad Oak, Accrington BB52DJ United Kingdom	Graphics, time-series, regress., data manipulation, missing data, table formatting	Pascal	Apple II	£450
AIDA ENCORE	Action-Research Northwest (A-RN) 11442, Marine View Dr., SW. Seattle, WA 98146	Item reliability, construction, Cronbach-Alpha, data manipulation compliments AIDA	Basic	Apple II	$ 50
ANOVA II	Human System Dynamics 9010 Reseda Blvd. Suite 222 Northridge, CA 91324 213/993-8536	ANOVA, REGRESS., ANCOVA, many designs 1 to 5 factors, 2 to 12 levels. All interactions, marginals, means, cells, plots	NK	Apple II IBM PC	$150
A.STAT 83	Rosen Grandon Assoc. 7807 Whittier St. Tampa, FL 33617 813/985-4911	Transformations, descriptive, frequencies, tables, regress., path anal., DIF files, regress., cross-tabs.	Basic	Apple II IBM PC PC jr.	$200

Package Name	Vendor	Description	Language	System	Approx. Price*
BETASTAT	Belanger Research Asso. 541 W. 6th St. Azusa, CA 91702 213/969-4112	Large Database (192 var. unlim. N) stepwise regress., FA, disc func., ANOVA, ANCOVA, matrix manipulation	Basic MSDOS TRSDOS	Apple II CP/M	$300
BMDPC	BMDP Statistical Software, Westwood Blvd., #202, Los Angeles, CA 90025	Data display and description, easy to use, numerous statistical operations	NK	NK	NK
CAPSAS	Pending release University of Michigan Inst. for Social Research, Ann Arbor, MI 48109	Computer assisted program for the selection of appropriate statistics	Basic	Apple II	NK
CAPSS	Dr. John Camp 260 Coll. of Ed., Wayne St. Univ., Detroit, MI 48202	Computer assisted problem solving and statistics, for 4th to 9th grade	Basic	Apple II	NK
CONDUIT	Conduit 100 Lindquist Ctr., Univ. of Iowa, P.O. Box 388, Iowa City, IA 52244	Computer based learning materials for statistics teaching	Basic	Apple II	varies
CRISP	Crunch Software 2547 22nd Ave., San Francisco, CA 94116 415/564-7337	DBMS, ANOVA, corr., cross-tab., freq., means, plots, t-test, Wilcoxin	NK	IBM PC	$495
CURVE	West Coast Consultants 1775 Lincoln Blvd., Tracy, CA 95376	Cartesian, parametric polar equa., bar graphs (subroutines)	NK	Apple II	$ 50 + $75

Package Name	Vendor	Description	Language	System	Approx. Price*
CURVE FITTER	Interactive Microware Inc., P.O. Box 771 Department SK State College,PA 16801	Best fit, scales average, smooth, interpolate, least squares	NK	Apple II	$ 35
DAISY	Rainbow Computing, Inc. 8811 Amigo Avenue Northridge, CA 91324 213/349-0300	Descriptive, regression, transforms, tests, ANOVA, nonparametric, plots, timeseries, modeling	NK	Apple II	$200
DATA SMOOTHER	Dynacomp, Inc. 1427 Monroe Ave., Rochester, NY 14618	Dynacomp has a whole series of statistical packages for a very wide variety of computers and statistical functions	NK	Extensive number	$ 24
DATA-X	Patrick Royston 85 Canfield Gardens London NW6 3EA United Kingdom	Data editing nonparametric, ANOVA, regression, descriptive, manipulation	Basic	PET	£350
DB MASTER STAT PACK	Stoneware Micro-Computer Products 50 Belvedere Street San Rafael, CA 94901	Uses DB Master files to do descriptives, freqs., MW-U, sign test, ANOVA w Newman-keuls, regress., corr.	Basic	Apple II	$ 99
DELTA-DSS	Evans Economics, Inc., 2101 L St. NW., Suite 510 Washington, DC 20037 800/368-5974	Delta-Stat is actually part of a broad-based business work-station, mainly does modeling, forecasting	NK	IBM PC	$2000
DESCRIPTIVE STATISTICS	Com Press P.O. Box 102 Wentworth, NH 03282	Designed to supplement textbooks on elem. stat. and prob. descriptive freqs., dist. line plot	NK	Apple II	$ 60

Package Name	Vendor	Description	Language	System	Approx. Price*
DESCRIPTIVE STATISTICS & REGRESSION ANALYSIS	Advanced Operating Systems 450 St. John Michigan City, IN 46360	Descriptives, curvelinear regress., mult. linear regressions.	NK	Apple II	$ 22
DYNACOMP	Dynacomp Inc. 1427 Monroe Ave. Rochester, NY 14618	Regression, ANOVA	Basic	Apple II Atari TRS-80 PET	Reg-$119
EDSTATPAC	Univ of Michigan School of Education Ann Arbor, MI 48109	Desciptive, freqs., chi-square, ANOVA, two-way ANOVA, non-parametric, regression, correlation, Cronbach-Alpha	Basic MBASIC	Apple II IBM PC CP/M Macintosh	$ 25
ELF STATISTICAL PACKAGE	The Winchendon Group P.O. Box 10114 Alexandria, VA 22310	Data trans., descriptives, Xtabs, freqs., histo., corr., step regress., factor anal., disc. anal., plots	NK	Apple II	$200
EXPLORATORY DATA ANALYSIS	CONDUIT 100 Lindquist Ctr., University of Iowa P.O. Box 388, Iowa City IA 52244	Application of nine basic EDA techniques	NK	Apple II	$150
GASP	Wootton, Jeffreys & Ptnrs, Cemetery Pales Brookwood, Woking, Surrey United Kingdom	Verification and and editing, expansion, tabulation, data manipulation	FORTRAN	CP/M	£ 500
GAUSS	Applied Technical Systems, P.O. Box 6487, Kent, WA 98064 206/631-6679	Matrix programming language	IBM PC	NK	$250

Package Name	Vendor	Description	Language	System	Approx. Price*
INTER-STAT	Great Northern Computer Services 116 Low Lane Horsforth, Leeds LS18 5PX United Kingdom	Descriptive, distributions, tests chi-square, regression, plots	Basic	Apple II	£150
INTRODUC-TION TO PSYCHO-LOGICAL STATIS-TICS	Com Press P.O. Box 102 Wentworth, NH 03282	Designed to help teach undergrad. psych. stats. descriptive & inferential stats.	NK	Apple II	$ 60
INTRO-STAT	Ideal Systems P.O. Box 681 Fairfield, IA 52556 515/472-4507	Xtabs, student-t, Mann-Whit. U, Wilcox, 1, 2 & 3 Way ANOVA, corr., regress., cross-tabs., plots, non-para.	NK	Apple II Apple III IBM PC Atari 800	$125
KEYSTAT	Brooks/Cole Monterey, CA 93940-3266	Intended primarily for teaching intro. statistics, uses basic statistical functions	Basic	Apple II	$ 70
LINEAR REG-RESSION	MPA Enterprizes PO Box 6020 Wyomissing, PA 95060	ANOVA, coeff., F-stat, Dubin-Watson, r2	NK	Apple II	$ 25
MASS	Westat Associates 60 Bruce Street Nedlands, West Australia 6009 Australia	Data manage-ment, descriptive, cross-tabs., histograms, plots, chi-sq., t-test, regression, time-series discriminant, non-parametric, ANOVA, log-linear	Pascal	CP/M	NK
MBC TEST CONSTRUC-TION PACKAGE	Moore-Barnes Co., P.O. Box 517, Roseburg, OR 97470 503/673-0345	Cronbach Alpha, variances, item diff., variances, corr.	NK	Apple II	$ 70

PACKAGE Name	Vendor	Description	Language	System	Approx. Price*
MBC CORRE-LATION PACKAGE	Moore-Barnes Co. P.O. Box 517 Roseburg, OR 97470 503/673-0345	Pearson, point bi-serial, phi tetra-choric, Spearman, Kendell Tau, Goodman & Kruskal, Gamma, Jaspen multi-serial, Eta, Theta, Guttman G	NK	Apple II	$150
MDCSTAT	2.0 MDC P.O. Box 115 Novato, CA 94948	Data editor, t and F tests, curve fit, regress., descrip-tives, XY plot	NK	CP/M	$ 50
MICRO-DSS/A	Addison-Wesley Publ. Co. Reading, MA 01867 617/994-3700	Descriptives, freq., multi-re-gress., cross-tabs., ANOVA plots, business orientation	NK	IBM PC Apple II Apple III	$495
MICROQUEST	Quest Software Queensleigh House 167 Queensway	Verification and editing, hole count, data manipulation data entry, tabu-lation (multipunch, filters, and weighting)	Basic	Apple II	16,000 including hardware
MICROSTAT	Ecosoft 6413 North College Ave., Indianapolis, IN 46220	Data Management, transformation, descriptive, tests, 1&2-way ANOVA, plots, regression, time series, non-parametric, cross-tabs., distributions, chi-sq., interactive and batch processing, hypothesis tests, easy installation	Basic	CP/M Apple II IBM PC	$375
MICRO SURVEY	Systematica 112 Strand London, England WC 2 OAA United Kingdom	Verification and editing, data manipulation, tabulation (filters and weighting, mul-tidimension, multiple source fields), re-gression, descriptive statistics	FORTRAN	CP/M	1,200

Package Name	Vendor	Description	Language	System	Approx. Price*
MINITAB	Mintab Inc. 215 Pond Lab University Park, PA 16802 814/865-1595	Descriptive, regress., ANOVA non-para., EDA, time series, Box and Jenkins, matrix oper.	NK	IBM PC	$1800 $ 900 (50% less academics) update $300
M-STAT	M-STAT, P.O. Box 17075, Milwaukee, WI 53217 (414)351-2771	Menu-driven, ANOVA, non-parametric, 255 variables	NK	PC	$795
MSUSTAT	Research Development Inst. Montana State U., R.E. Lund Bozeman, MT 59717-0002 406/994-3271	Descriptive, cross-tabs., t-tests, non-parametric, attribute data, ANOVA, CoANOVA, mult. regress., log-linear, mult. compar., multivari., samples, random	FORTRAN	CP/M-80 MSDOS	$500
MULTIPLE REGRESSION ANALYSIS	Systems Design Lab 26212 Artesia Redondo Beach, CA 90278	Includes corr. matrices, std. deviations	NK	Apple II	$ 30
MULTISTAT	Davell Custom Software P.O. Box 4162 Cleveland, TN 37311	Multivariate database statistics, reports linear regress., plots printouts	NK	IBM PC	$290
NUMBER CRUNCHER	DR. Jerry Hintze, 865 E. 400 North Kaysville, UT 84037 801/546-0445	DBMS, uni-, bivariatesplots, freqs., histo., 1 way ANOVA, mult. and step regress., chi-square	Basic	Commodore 64	$ 53
NUMBER CRUNCHER STAT SYS	NCSS-Mac, 865 E. 400 N., Kaysville, UT 84037 801/546-0445	Integrated, menu-driven, regression, t-test, correlation, scatter plots, ANOVA, cross-tabs., non-parametric	NK	Macintosh	$149

Package Name	Vendor	Description	Language	System	Approx. Price*
NWA STATPAK	Northwest Analytical, Inc., 1532 SW. Morrison St., Portland,OR 97205 503/224-7727	Extensive, data manipulation descriptives, std. scores, regress. (extensive), non-parametric (extensive), means tests contingency tables, ANOVA's	MBASIC	CP/M MSDOS BTOS CTOS Macintosh	$495
1,2,3 FORECAST!	Forecast! P.O. Box 12582, Salem, OR 97309	Menu-driven template for Lotus 1-2-3, forecasts time series data in 1-2-3 files, linear/nonlinear regression, smoothing, decomposition, easy to read	NK	NK	$ 75
PC-LISREL	Scientific Software, Incorporated P.O. Box 536 Morresville, IN 46158	Incorporates all options of mainframe version except polychoric and polyserial correlations	NK	IBM PC, 256K RAM	NK
PC STATISTICIAN	Human Systems Dynamics 9010 Reseda Blvd. Suite 222 Northridge, CA 91324 213/993-8536	DBMS, descriptives, freqs., t-tests, ANOVA, non-param, curve fits, cross-tabs.	Basic	IBM PC	$300
PERSONAL DATA ANALYSIS	Personal Computers Ltd. 220-226 Bishopsgate London EC2 United Kingdom	Regression, cluster, time series, LP, manipulation, plots, data entry, Box Jenkins, links to Visicalc	Basic	Apple II	7 modules, £ 75-125@
PLAIN VANILLA STATISTICS	Plain Vanilla Soft-Ware, 33728 Terra Circle Corvallis, OR 97333	Easy, menu-driven, regular/block ANOVA and covariance, Latin square, least sig. dif., missing data, probability, t-tests, chi-squares, simple regression	NK	Apple II	$ 50

Package Name	Vendor	Description	Language	System	Approx. Price*
PLOTRAX	Omnicorn Software Suite 590, Bldg. 57 Exec. Park, NE. Atlanta, GA 30329	Menu driven graphics, linear/ poly regress., curve-fit, ANOVA	NK	IBM PC	$195
REGRESSION I REGRESSION II	Dynacomp, Inc. 1427 Monroe Ave. Rochester, NY 14618	Polynomial curve fit imbedded parameter	NK	Apple II	I $24 II $24
SAM	International Software (UK) P.O. Box 160 Welwyn Gdn. City, Herts England AL8 6TQ United Kingdom	Data management, cross-tabs., regression, cluster, factor, ANOVA, descriptive, texts, discriminant, plots	Basic PET CP/M	Apple II	£335
SCIENTIFIC PLOTTER	Interactive Microware, Inc. P.O. Box 771 Dept. SK State College, PA 16801	Draws X/Y graphs, 20 symbols, error bars	NK	Apple II	$ 25
SCIENTIFIC SUBROUTINES	Alpha Computer Services P.O. Box 2517 Cypress, CA	Fortran stats., subroutines corr., regress., disc func. analysis, time freq., nonparametric and more	NK	IBM PC	$295
SIGSTAT	Significant Statistics, 3336 North Canyon Road, Provo, UT 84604 801/377-4860	30 programs of BMD series, ANOVA, regress., multi-cannonical, factor analysis, cross-tabs., time series, plots	NK	128K IBM PC supports 8087	$325
SL-MICRO	Questionnaire Service Co. Box 23056 Lansing, MI 48909 517/641-4428	Freq., cross-tab., descrip., regress., corr. data transformation	CBASIC (compiler not required	CP/M IBM PC MSDOS CP/M-86	$250

Package Name	Vendor	Description	Language	System	Approx. Price*
SMART FORECAST	Smart Software, Inc., 392 Concord Ave., Belmont, MA 02178 617/489-2743	Statistical judgmental, automatic and multtime series forecasts, series forecasts, graphics, DBMS, regress.	Pascal	IBM PC compatibles	$495
SNAP	Mercator 3 Whiteladies Road Clifton, Bristol BS8 1NU United Kingdom	Questionnaire preparation, verification and editing, hole count, tabulation (multipunch, filters and weighting), descriptive statistics, histograms	Basic	CP/M	£ 640
SOFTWARE A-STAT 83	Rosen Grandon Associates, Inc. 7807 Whittier St., Tampa, FL 33617	Factor analysis, freq., cross-tabs., t-tests, ANOVA, correlations, regression, data entry, sort reports, menu-driven	NK	NK	$200
SOFTWARE PAC #3	Basic Business Software, Inc. 3300 Sirius, STE 10, Las Vegas, NV 89102	F-dist., Xtabs, regress., log trans., one & two ANOVA, t-stat., descrip., variety of distributions	NK	Apple II	$ 35
SPEED STAT 1	Soft Corp International 229 Huber Village Blvd. Westerville, OH 43081	Freqs., cross-tabs, correlations, descriptives	Assem/ Basic	Apple	$200 $250
S.P.S. STATISTICAL PAC	DBi Software One Energy Place, 5805 Pickard Rd. Mt. Pleasant, MI 48858 800/221-3791 800/624-8122(Mich)	Data manip., descriptive, plots, ANOVA, GLM, t-test, cross-tabs., FA, PCA, image analysis	NK	Apple II MSDOS	$395

Package Name	Vendor	Description	Language	System	Approx. Price*
SPSS/PRO SPSS/PC	SPSS Inc. 444 North Michigan Ave. Chicago, IL 60611 312/329-2400	File mgmt., uni-crosstabs., Mult. regress., ANOVA, non para., FA, log linear, plots	NK	DEC Pro 350, IBM PC	$600 $800
STATFAST	Statsoft 2831 East 10th St., Suite 3, Tulsa, OK 74104	Descriptives, t-tests, ANOVA, non-parametrics, easy to use, menu-driven, large data files, fast, graphics	NK	Mac-intosh	$ 99
STAT-GRAPHICS PC	Statistical Graphics Corp. Research Park, 2 Wall St. Princeton, NJ 08540 609/924-9374	Integrated system of 250+ functions; data analysis, DBMS, graphics, regress., ANOVA, quality, time series, forecasting, robust methods	APL	IBM PC or XT	$575 $195 (add. copy, site lisc. avail.)
STATISTI-CAL	Basic Business Software, Inc. P.O. Box 26311 Las Vegas, NV 89126	24 stat. programs, distribution, hypothesis tests	NK	IMB PC	$ 75
STATISTI-CAL ANA-LYSIS	Aerocomp Inc. 3303 Harbor Blvd. Costa Mesa, CA 92626	NK	NK	CP/M	NK
THE STATIS-TICIAN	Quant Systems Box 628 Charleston, SC 29402 800/334-0854	DBMS, Mult. regress., trans. descriptives, ANOVA, 2way, time series, non-parametric random generator, plots	NK	TRS-80 CP/M IBM PC XENIX	$300 $600
STAT-ISTICIAN'S MACE	Mace, Inc. 2313 Center Ave., Madison WI 53704 608/241-4566	Descriptive, MR, corr., ANOVA, nonparametric	NK	128K MS-DOS PC-DOS	$195

Package Name	Vendor	Description	Language	System	Approx. Price*
STATIS-TICS	EduWare Services 28035 Dorothy Dr. Agoura, CA 91301	Freq., Xtabs, t-test, corr., descriptives	NK	Apple II	$ 16
STATISTICS (BIO) II	A2 Devices P.O. Box 2226 Alameda, CA 94501	Hi-res., graphics, lin. regress., data plot, curve regress.	NK	Apple II	$ 60
STATIS-TICS-MAC-INTOSH	Time Zero Software, 1855 North Oak Lane, State College, PA 16803	Descriptvies, normal dist., Pearson corr., regression, 4t-tests, ANOVA, data filehandling routines	NK	Mac-intosh, Microsoft BASIC	$ 60
STATISTICS PAC	Creative Discount Software 256 S. Robert-son, Suite 2156, Beverly Hills, CA 90211	Data manage-ment, curve fitting, probability, general statistics	Basic	TRS-80 Apple II	$100
STATISTICS PACKAGE	Ongoing Ideas RD#1 Box 20 Starkboro, VT 05487	Scatter, Xtab t-test, MW-U sign test	NK	Apple II	$ 25
STATISTICS PACKAGE	Old Bird Software John C. Dvorak 704 Solano Albany, CA 94706	Descriptive, regression, tests, histograms, ANOVA	Assem-bler	CP/M	$ 50
STATISTICS PACKAGE	Lombardy Computers 121 High St. Berkhampstead Herts HP4 2DJ United Kingdom	Descriptive, ANOVA, chi-square	Basic	Apple II	122

Package Name	Vendor	Description	Language	System	Approx. Price*
THE STATISTICS SERIES	Human Systems Dynamics, 9010 Reseda Blvd. Suite 222 Northridge, CA 91324 213/993-8536	ANOVA II. ANOVA, ANCOVA, Latin sq. repeated meas., block	Basic	Apple II	$150
		STATS PLUS. Data manip. freq., cross-tabs., corr., non parametric	Basic	Apple II	$200
		REGRESS II. Reg., time series, plots	Basic	Apple II	$150
		CALCU-PLOT. Plots equations, data derivatives, integrals, graphs	Basic	Apple II	$150
STATISTICS SOFTWARE FOR MICROS	Kern International, Inc. 433 Washington Street P.O. Box 1029 Duxbury, MA 02331	19 programs, summaries, binomial and normal probabilities, chi-Square, ANOVA, Latin squares, regression, scatter plots, residual plots	BASIC	IBM, Apple, Z-100	$ 62
STATMATE	Software Hill 1857 Apple Tree Lane, Mountain View, CA 94040 415/969-4233	Descriptives, t-test, ANOVA, 2-way, regress., non-parametric, histogram, data manipulation	NK	Cromemco	$150
STATMATE/PLUS	Software Hill 1857 Apple Tree Lane, Mountain View, CA 94040 415/969-4233	Plots, curve fits, trans., data edit/manip., lag data operations, DBMS tranformations	NK	CP/M IBM PC Cromemco version (called IFDAS)	$225
STATWORKS	Heyden & Son, Inc., 247 S. 41st St. Philadelphia, PA 19104	Regression, normality, ANOVA, precision, graphics, mainframes, 50000 data points.	NK	Macintosh	$125
STATMASTER	Little, Brown and Company Boston, MA	Applications oriented approach to teaching statistics, accompanies a workbook	NK	NK	NK

Package Name	Vendor	Description	Language	System	Approx. Price*
STAT PAC	Walonick Assoc., 5624 Girard Ave. S. Minneapolis, NM 55419 612/866-9022	A complete data manager. Stat. analysis package similar to main-frame SPSS	Compiled Basic	IBM KAYPRO VICTOR NCR TRS-80	$400
STATPLAN	The Futures Group 76 Eastern Blvd. Glastonbury, CT 06067 203/633-3507	Descriptive, ANOVA, regress., cross plots, histograms, time series	NK	IBM PC	$ 50
STAT-PAC II	Scientific Microprograms 213 Merwin Rd. Raleigh, NC 27606	Data manip., histograms, cross-tabs., plots, corr., curve fits, regress., t-test, ANOVA	NK	Apple II	$750
STAT POWER	ABT Micro-Comp. Soft-ware, 55 Wheeler St. Cambridge, MA 02138	Stat. power analysis, confidence, effect, size	NK	Apple II	$ 50
STATS PLUS	Human Systems Dynamics 9010 Reseda Blvd. Suite 222 Northridge, CA 91324 213/993-8536	General statis-tics, package database manage-ment, non-para-metrics, freqs., corr., t-tests, regressions	NK	Apple II	$200
STATVIEW	BrainPower, Inc., 24009 Ventura Blvd. Calabasas, CA 91302	Good for working with numbers, includes Dr. Vicki Sharp's college textbook, many functions	NK	Macin-tosh	$200
STEPWISE MULTIPLE REGRESS	Apple Computer, Inc. 10260 Bandley Dr. Cupertino, CA 95014 408/996-1010	Regression, F, corr., resid.	Basic	Apple II	$150

Package Name	Vendor	Description	Language	System	Approx. Price*
STRATIX	Stratix, Inc. P.O. Box 1014 Woodinville, WA 98072-1014 206/821-1896	Three forecasting packages: MICROBJ, NUAMETRICS, and XTRAPOLATOR, all menu-driven, graphics, manuals	NK	PC, XT, AT	$295 $195 $195
SURVTAB	Statistical Computi Consultants 10037 Chestnut, Wood Lane, Burke, VA 22015 703/250-9513	Tabulates data from questionnaire, cross-tabs., freqs., means	NK	IBM PC	$180
SYSTAT	Systat, Inc. 1127 Ashbury Evanston, IL 60202 312/864-5670	Relational DBMS, extensive graphics, plots, steam & leaf etc., descriptive, multiway tables, regress., GLM, ANOVA, ANCOVA, MANOVAPCA, multidim. scaling	NK	IBM PC CP/M	$500
VALUECON BUSINESS FORECASTER	ValueCon Technologies P.O. Box 241391 Memphis, TN 38124-1391 901/365-7929	Data edit, forecasting, ANOVA, ANCOVA, regress., data smoothing, Box-Jenkins	NK	IBM PC	$1000
VARIES	TRS-80 Applications Software Sourcebook Tandy Radio Shack Stores Fort Worth, TX 76012	A range of statistical routines available for TRS-80 micros	Mainly Basic	TRS-80	NK
VIDI-CHART	Interactive Microware, Inc. P.O. Box 771 Dept. SK State College, PA 16801	Plots A/D input, adds, subtracts, multiplies, divides integrates, differentiates, average, normalize	NK	Apple II	$ 75

Package Name	Vendor	Description	Language	System	Approx. Price*
VISITREND VISPLOT	Visicorp 2895 Zanker Rd., San Jose, CA 95134	Lag/lead, %change, moving averages, descriptives, plots line, bar, pie charts, scatter plots	Assem IBM PC	Apple II	NK
VISUAL STATISTICS	Kern International, Inc. 433 Washington Street P.O. Box 1029 Duxbury, MA 02331	Emphasis on graphics, see x,y points on screen, recall and merge data files, bar charts, sort, percent, running average, x-mean, y-mean, weighted x-mean, linear regression	BASIC	IMB, Apple, Z-100	$ 65

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